meteorologists, in previous years the immense majority of British storms have had their centres to the northward of the British Isles. The proximate cause of the peculiar distribution of storms of wind during 1873 lay not in the position of the paths of the storm-centres, but in the manner of the distribution over Great Britain of the steeper barometric gradients of the atmospheric depressions of the storms of 1873 as they swept eastwards over north-western Europe.

It would have been satisfactory if the comparison which has been instituted by the Office between the observations from Valencia, in Ireland, and Angra do Heroismo, in the Azores, had been detailed in the Report, seeing that it is inferred from the result, "beyond the possibility of a doubt, that reports from a station situated at the Azores would be practically useless to the Office in giving early intimation of approaching storms." The grounds of this strongly-expressed opinion on a point of some importance in weather telegraphy, and contrary to the views entertained by not a few meteorologists, ought to have been stated.

In the Committee's Quarterly Weather Report for 1870 the position of the thermometers at each of their seven observatories was described and figured. We hope that in the next Report a detailed account will be given of the position and exposure of the thermometers at the stations from which the daily telegraphic weather reports are sent, in order that meteorologists may judge how far the observations made at these stations might be available in investigating the climate of the British Isles, and in some other meteorological inquiries. This is by many deemed necessary, especially when it is considered that the Office has not hitherto published any mean temperatures from the daily observations made at their telegraphic stations, and some of these stations, particularly in Ireland, are in parts of the British Isles, of whose climate little is yet known.

GEOLOGY AND AGRICULTURE

Applications de Géologie et l'Agriculture, par M. Amédée Burat, Engineer, Professor at the Central School of Arts and Manufactures. (Paris: Rothschild, 1874.)

GEOLOGY is one of the most interesting of modern sciences. Soon after it assumed shape high hopes were entertained as to its value to the farmer: up to the present these hopes have not been realised. And yet the study of geology is most intimately connected with agricultural pursuits. Surface geology deals with the soil which daily occupies the thoughts and labours of the farmer. There is one phase of surface geology which has been almost wholly neglected of late; we refer to the connection between soils and the rock-formations from which soils have been derived. It is here possibly that there is the widest field for original research. It was hoped that this branch of agricultural science would have received much attention from the present secretary to the Royal Agricultural Society of England, who had previously been a diligent student of geology and secretary to the Geological Society. So far, his hands would appear to have been full of other work, and he has done little where much was expected.

That there is a most intimate connection between soils and rock-formations is well known. In some places the soil is the direct product of the disintegration of the underlying rock. It more frequently happens, however, that the soil has not been derived from the rock on which it rests, but consists of drifted material. The study of this drifted material is most interesting to the geologist, and ought to be most instructive to the farmer. It enables the geologist to understand the direction and force of former water-currents; and thus throws light on obscure phenomena. A careful examination of the drift enables us to trace the origin of the soil. Thus, for example, a study of the stones and pebbly particles of the soil, enables us not only to know the rocks from which it was derived, at all events partly, but also to understand the rate at which plant-food may become liberated on the soil by the disintegration of these very stones and pebbles. On this point a word of explanation may be here offered.

If we examine a fertile soil at any time we shall find that only a very small portion of its substance (seldom more than one per cent.) is in a condition fit for nourishing our crops, the great bulk of its substance being locked up in a condition at the moment unavailable. By the action of air, of moisture, of heat, and of manure, part of this unavailable matter becomes available for crops. It is on the rate at which the process of disintegration—or liberation of plant-food—takes place that the *natural* power of production of the soil chiefly depends. The study of agricultural geology from this point of view is manifestly of the highest scientific and practical importance: it opens up a wide field for original research. We had hoped, on receiving M. Burat's little volume, that he would have taken up the subject. We have been disappointed.

The work is, not, however, without merit. The language is simple, and the style as lucid as need be.

In the introduction the author leads the reader to expect a fuller exposition of the relation between geology and practical farming than he will find in the volume. The book contains four chapters. The first is a disquisition, couched in very general terms, on the physical characters and composition of soils. As an illustration of the very general character of the matter we quote the average composition of fertile soils (p. 8):—

Every 100 parts contain—

35	gravelly particles	of the size of peas
45	ditto	ditto millets
10	ditto	of fine sand
10	ditto	of fine material, separable by washing.

We are next furnished with a general "ultimate" chemical composition of an average soil. Information of this kind possesses no value except to the junior student.

The second chapter is devoted to manures, which are treated in a popular manner. The third chapter is on the action of water, and the subject is treated in an interesting manner; the services of the Abbé Paramere are duly acknowledged. The fourth, and last, is the most interesting chapter in the work. Here the author shows very clearly that there is a connection between geology and agriculture, drawing illustrations from the primary, secondary, and tertiary groups of rocks. Soils formed from granitic

rocks are, in Great Britain and Ireland and elsewhere, deficient in lime. In our own experience we have seen most valuable results produced by the application of lime to these soils; and we learn from M. Burat that by the same means several districts in the West of France, which formerly were unable to maintain their people without extraneous supplies of food, have (*i.e.* by the use of lime) become the largest exporters of grain. All the author's illustrations are taken from France, but they have their counterparts in these islands.

On the whole, we are justified in saying that the little work will well repay perusal.

OUR BOOK SHELF

Flora of Dorsetshire. By J. C. Mansel-Pleydell. (London: Whittaker and Co. Blandford: W. Shipp.)

Flora Cravoniensis: or, a Flora of the Vicinity of Settle in Craven, Yorkshire. By John Windsor. (Manchester: Cave and Sever, 1873. Printed for private circulation.)

ALTHOUGH the boundary-lines of our counties are, as a rule, purely arbitrary, it is probably wise for the compilers of local floras to maintain them rather than to erect new ones of their own. The area of their observations is, at all events, thus rendered perfectly clear and certain. Dorset has long been famous for its palæontological wealth, both vegetable and animal; and we have here a record of its living flora, which, as might be expected from its length of sea-board and its variety of geological formations—lias, oolite, forest marble, Oxford clay, coral rag, Kimmeridge clay, Portland sand, Purbeck, chalk, and Eocene—is a rich one. The value of local floras depends greatly on the dependence that can be placed on the determination of the species by the editor and his *collaborateurs;* and on this point it seems to us that the present work can be safely trusted, great pains having been taken to establish the authenticity both of the localities and of the nomenclature. The county is divided into seven districts determined by the drainage, and therefore generally separated by high land; and a very good map of the county accompanies the volume. Among the greatest botanical rarities of the county (some of them almost unique) are—*Polycarpon tetraphyllum*, *Lotus hispidus*, *Simethis bicolor*, *Leucojum vernum* (doubtfully native), *Carex clandestina*, *Scirpus parvulus*, and *Cynodon dactylon*. The flora is confined to flowering plants and vascular cryptogams.

Mr. Windsor's "Flora of Craven" (the veteran author did not live to see its publication, or rather printing) is compiled on a different plan, the area being a somewhat arbitrary one: "about Settle and its neighbourhood to a moderate distance, generally within twelve miles, but in a few instances extending somewhat further." The district is a remarkably interesting one, whether from a geological or a botanical point of view; and the flora has been compiled with as great care as in the other case under notice, with the assistance of several good local botanists, and includes not only the flowering plants and vascular cryptogams, but also the Characeæ, Mosses, Hepaticæ, and Lichens. A district that includes among its native plants such rarities as *Polemonium cœruleum*, *Epipactis ovalis*, and *Cypripedium calceolus*, is of no ordinary interest.

Both these volumes are useful contributions to our library of local botany. We would especially commend to compilers of similar works the plan adopted by Mr. Mansel-Pleydell, of giving the geographical range of each species in the neighbouring counties of England and on the opposite coast of France.

A. W. B.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Migration of Birds

THE subject to which Prof. Newton has called attention is one of great interest to all naturalists, and requires to be studied systematically; for I can hardly think that the solution is so "simple in the extreme" as Mr. Newton thinks it may be.

It appears to me probable that here, as in so many other cases, "survival of the fittest" will be found to have had a powerful influence. Let us suppose that in any species of migratory bird, breeding can as a rule be only safely accomplished in a given area; and further, that during a great part of the rest of the year sufficient food cannot be obtained in that area. It will follow that those birds which do not leave the breeding area at the proper season will suffer, and ultimately become extinct; which will also be the fate of those which do not leave the feeding area at the proper time. Now, if we suppose that the two areas were (for some remote ancestor of the existing species) coincident, but by geological and climatic changes gradually diverged from each other, we can easily understand how the habit of incipient and partial migration at the proper seasons would at last become hereditary, and so fixed as to be what we term an instinct. It will probably be found, that every gradation still exists in various parts of the world, from a complete coincidence to a complete separation of the breeding and the subsistence areas; and when the natural history of a sufficient number of species in all parts of the world is thoroughly worked out, we may find every link between species which never leave a restricted area in which they breed and live the whole year round, to those other cases in which the two areas are absolutely separated. The actual causes that determine the exact time, year by year, at which certain species migrate, will of course be difficult to ascertain. I would suggest, however, that they will be found to depend on those climatal changes which most affect the particular species. The change of colour, or the fall, of certain leaves; the change to the pupa state of certain insects; prevalent winds or rains; or even the decreased temperature of the earth and water, may all have their influence. Ample materials must exist, in the case of European birds, for an instructive work on this subject. The two areas should be carefully determined for a number of migratory birds; the times of their movements should be compared with a variety of natural phenomena likely to influence them; the past changes of surface, of climate, and of vegetation should be taken account of; and there seems no reason to doubt that such a mode of research would throw much light on, if it did not completely solve, the problem.

This is an appropriate opportunity for making a suggestion which has long been in my mind. It is, that it would be a valuable and interesting addition to NATURE, if we were supplied with a weekly (or monthly) "Calendar of Periodical Phenomena in Natural History," such as the average dates of appearance and departure of migratory birds, of the opening and fall of the leaf of our forest trees and common cultivated trees and shrubs; of the flowering of our common field and garden plants; and also the mean *highest* and *lowest* temperature of each *day*, the direction of the wind and amount of rainfall for each *week*, according to the Greenwich averages. None of this information is given in the usual almanacks or periodicals, and it is by no means easy to find it when wanted. Yet it is surely of much value to everyone who lives in the country, and would be the means of exciting an intelligent interest in such observations and inquiries as those to which Prof. Newton has called our attention in his interesting article.

ALFRED R. WALLACE

Regular Motion in Clockwork

IN order to ensure perfectly regular motion in the clockwork which drives the revolving dioptric apparatus made by Messes. Chance, Bros. and Co., I have recently introduced a centrifugal governor, which might perhaps also be useful for the clocks of equatorials. Though it involves nothing new in principle, the form differs from anything I have seen, in that the governor balls have to lift a heavy weight, and that the leather rubbers or brushes are not carried by the revolving balls, but are fixed to the frame of the clock and rub against the disc which forms the extra weight lifted by the balls. The sketch shows the governor